

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A nitride-based compound semiconductor electron device comprising:

a substrate; and

a semiconductor layer structure including a buffer layer structure, a channel layer and a donor layer, that are consecutively formed in this order on said substrate, wherein:

said buffer layer structure includes: at least one first buffer layer comprising as a main component thereof a compound semiconductor expressed by the general formula of

$\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{As}_u\text{P}_v\text{N}_{1-u-v}$ (where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $x+y \leq 1$, $0 \leq u < 1$, $0 \leq v < 1$, and $u+v < 1$); and

at least one second buffer layer comprising as a main component thereof a compound

semiconductor expressed by the general formula of $\text{Al}_a\text{In}_b\text{Ga}_{1-a-b}\text{As}_c\text{P}_d\text{N}_{1-c-d}$ (where $0 \leq a \leq 1$,

$0 \leq b \leq 1$, $a+b \leq 1$, $0 \leq c < 1$, $0 \leq d < 1$, and $c+d < 1$), wherein said first buffer layer and said second

buffer layer have different bandgap energies, and have two-dimensional electron gas density

or densities therein not greater than $5 \times 10^{12} \text{ cm}^{-2}$ [[,]]; and

said first and second buffer layers comprising one of Mg, Be, Zn, and C in an amount of not less than $1 \times 10^{16} \text{ cm}^{-3}$ and not greater than $1 \times 10^{21} \text{ cm}^{-3}$; and

said first buffer layer having a thickness of not less than 0.5 nm and not greater than 20 nm, and said second buffer layer has a thickness of not less than 0.5 nm and not greater than 20 nm.

Claim 2 (Canceled).

Claim 3 (Currently Amended): The semiconductor electron device according to claim [[2]] 1, wherein said ~~second buffer layer has a bandgap energy greater than a bandgap energy of said first buffer layer and has an Al composition not less than 0.5 and a thickness not less than 1 nm and nor greater than 10 nm~~ first buffer layer has an Al composition of x, and said second buffer layer has an Al composition not less than (x+0.5).

Claim 4 (Currently Amended): The semiconductor electron device according to claim [[2]] 1, wherein said ~~first and second buffer layers comprise one of Mg, Be, Zn, and C in an amount of not less than $1 \times 10^{16} \text{ cm}^{-3}$ and not greater than $1 \times 10^{21} \text{ cm}^{-3}$~~ buffer layer structure includes a plurality of first buffer layers and a plurality of said second buffer layers, which are alternatively laid one on another.

Claim 5 (Currently Amended): A nitride-based compound semiconductor electron device comprising:

a substrate; and

a semiconductor layer structure including a buffer layer structure, a channel layer and a donor layer, that are consecutively formed in this order on said substrate, wherein:

said buffer layer structure includes: at least one first buffer layer comprising as a main component thereof a compound semiconductor expressed by the general formula of $\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{As}_u\text{P}_v\text{N}_{1-u-v}$ (where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $x+y \leq 1$, $0 \leq u < 1$, $0 \leq v < 1$, and $u+v < 1$); and at least one second buffer layer comprising as a main component thereof a compound semiconductor expressed by the general formula of $\text{Al}_a\text{In}_b\text{Ga}_{1-a-b}\text{As}_c\text{P}_d\text{N}_{1-c-d}$ (where $0 \leq a \leq 1$, $0 \leq b \leq 1$, $a+b \leq 1$, $0 \leq c < 1$, $0 \leq d < 1$, and $c+d < 1$),

said first buffer layer and said second buffer layer having different bandgap energies and having two-dimensional electron gas density or densities therein not greater than $5 \times 10^{12} \text{ cm}^{-2}$.

said first buffer layer having a thickness of not less than 0.5 nm and not greater than 20 nm, and said second buffer layer having a thickness of not less than 0.5 nm and not greater than 20 nm; and ~~The semiconductor electron device according to claim 2, having~~

said semiconductor electron device operates at an operating current of not less than 1 ampere or an operating voltage of not less than 100 volts.

Claim 6 (Currently Amended): The semiconductor electron device according to claim [[1]] 5, wherein said buffer layer structure includes a plurality of said first buffer layers and a plurality of said second buffer layers, which are alternately laid one on another.

Claim 7 (Currently Amended): A nitride-based compound semiconductor electron device comprising:

a substrate; and

a semiconductor layer structure including a buffer layer structure, a channel layer and a donor layer, that are consecutively formed in this order on said substrate, wherein:

said buffer layer structure includes: at least one first buffer layer comprising as a main component thereof a compound semiconductor expressed by the general formula of

$\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{As}_u\text{P}_v\text{N}_{1-u-v}$ (where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $x+y \leq 1$, $0 \leq u < 1$, $0 \leq v < 1$, and $u+v < 1$); and

at least one second buffer layer comprising as a main component thereof a compound

semiconductor expressed by the general formula of $\text{Al}_a\text{In}_b\text{Ga}_{1-a-b}\text{As}_c\text{P}_d\text{N}_{1-c-d}$ (where $0 \leq a \leq 1$,

$0 \leq b \leq 1$, $a+b \leq 1$, $0 \leq c < 1$, $0 \leq d < 1$, and $c+d < 1$).

said first buffer layer and said second buffer layer have different bandgap energies,
and have two-dimensional electron gas density or densities therein not greater than 5×10^{12}
 cm^{-2} ; The semiconductor electron device according to claim 6, wherein each of

said first buffer layers has a thickness of not less than 0.5 nm and not greater than 20
nm, and each of said second buffer layers has a thickness of not less than 0.5 nm and not
greater than 20 nm; and

said first and second buffer layers comprise one of Mg, Be, Zn, and C in an amount of
not less than $1 \times 10^{16} \text{ cm}^{-3}$ and not greater than $1 \times 10^{21} \text{ cm}^{-3}$.

Claim 8 (Currently Amended): The semiconductor electron device according to claim
6, wherein ~~each of said second buffer layers has a bandgap energy greater than a bandgap~~
~~energy of each of said first buffer layer [[and]]~~ has an Al composition ~~not less than 0.5 and a~~
~~thickness not less than 1 nm and not greater than 10 nm~~ of x, and said second buffer layer has
an Al composition not less than (x+0.5).

Claim 9 (Currently Amended): The semiconductor electron device according to claim
[[6]] 7, wherein ~~each of said first and second buffer layers comprises one of Mg, Be, Zn and~~
~~C in an amount of not less than $1 \times 10^{16} \text{ cm}^{-3}$ and not greater than $1 \times 10^{21} \text{ cm}^{-3}$~~ said buffer layer
structure includes a plurality of first buffer layers and a plurality of said second buffer layers,
which are alternatively laid one on another.

Claim 10 (Currently Amended): A nitride-based compound semiconductor electron
device comprising:

a substrate; and

a semiconductor layer structure including a buffer layer structure, a channel layer and a donor layer, that are consecutively formed in this order on said substrate, wherein:

said buffer layer structure includes: at least one first buffer layer comprising as a main component thereof a compound semiconductor expressed by the general formula of

$\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{As}_u\text{P}_v\text{N}_{1-u-v}$ (where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $x+y \leq 1$, $0 \leq u < 1$, $0 \leq v < 1$, and $u+v < 1$); and

at least one second buffer layer comprising as a main component thereof a compound semiconductor expressed by the general formula of $\text{Al}_a\text{In}_b\text{Ga}_{1-a-b}\text{As}_c\text{P}_d\text{N}_{1-c-d}$ (where $0 \leq a \leq 1$, $0 \leq b \leq 1$, $a+b \leq 1$, $0 \leq c < 1$, $0 \leq d < 1$, and $c+d < 1$),

said first buffer layer and said second buffer layer have different bandgap energies, and have two-dimensional electron gas density or densities therein not greater than $5 \times 10^{12} \text{ cm}^{-2}$;

said buffer layer structure includes a plurality of said first buffer layers and a plurality of said second buffer layers, which are alternately laid one on another; and

The said semiconductor electron device according to claim 6, having operates at an operating current of not less than 1 ampere or an operating voltage of not less than 100 volts.

Claim 11 (New): The semiconductor electron device according to claim 10, wherein said first buffer layer has an Al composition of x, and said second buffer layer has an Al composition not less than (x+0.5).

Claim 12 (New): The semiconductor electron device according to claim 10, wherein said buffer layer structure includes a plurality of said first buffer layers and a plurality of said second buffer layers, which are alternately laid one on another.

Claim 13 (New): The semiconductor electron device according to claim 5, wherein said buffer layer structure includes a plurality of said first buffer layers and a plurality of said second buffer layers, which are alternately laid one on another.